

**OPERABLE UNIT THREE RECORD OF DECISION FOR THE
OLEAN WELL FIELD SUPERFUND SITE RELATED TO THE ALCAS
SOURCE AREA**

**AMENDMENT TO THE OPERABLE UNIT TWO RECORD OF
DECISION FOR THE OLEAN WELL FIELD SUPERFUND SITE
RELATED TO THE ALCAS SOURCE AREA**

City of Olean, Cattaraugus County, New York

Figures 1 and 2 were provided for this review. The remaining figures and appendices were not provided.



United States Environmental Protection Agency
Region 2
New York, New York

September 2014

**DECLARATION FOR OPERABLE UNIT THREE RECORD OF DECISION
AND
AMENDMENT TO OPERABLE UNIT TWO RECORD OF DECISION**

SITE NAME AND LOCATION

Olean Well Field Superfund Site
City of Olean, Cattaraugus County, New York

Superfund Site Identification Number: NYD980528657
Operable Unit 02 and Operable Unit 03

STATEMENT OF BASIS AND PURPOSE

This decision document comprises the third operable unit Record of Decision (OU3 ROD) for the area identified herein as Parcel B of the Alcas Source Area at the Olean Well Field Superfund Site (Site), as well as an amendment to the September 1996 operable unit two Record of Decision (OU2 ROD Amendment) for the area identified herein as the Alcas Facility of the Alcas Source Area at the Site. By this document, the U.S. Environmental Protection Agency (EPA) selects a groundwater remedy for Parcel B and a modification to the groundwater and soil remedy for the Alcas Facility. These remedies are being chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. Section 9601-9675, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the OU3 remedy and the amended OU2 remedy for the Alcas Source Area. The attached index (see Appendix III) identifies the items that comprise the Administrative Record upon which the OU3 remedy and amended OU2 remedy are based.

The New York State Department of Environmental Conservation (NYSDEC) was consulted on the proposed remedy and proposed amended remedy in accordance with CERCLA Section 121(f), 42 U.S.C. Section 9621(f), and it concurs with the selected remedy and amended remedy (see Appendix IV).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response actions selected in this OU3 ROD and OU2 ROD Amendment, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The response actions in this OU3 ROD and OU2 ROD Amendment actively address soil and groundwater contamination at the Alcas Source Area. For purposes of this OU3 ROD and OU2 ROD Amendment, the Alcas Source Area includes the real property at which the Alcas Cutlery

Corporation formerly conducted manufacturing operations, located at 1116 East State Street, which is currently occupied by the Cutco Corporation (this facility is hereafter referred to as the Alcas Facility). The Alcas Source Area also includes several parcels of land to the south of the Alcas Facility identified on the City of Olean tax map as Block 2, Lots 23, 24 and a portion of Lot 44 that are impacted by contaminated groundwater (these parcels are hereafter referred to as Parcel B).

The major components of the selected amended remedy for the Alcas Facility include the following:

- *In-situ* chemical oxidation (ISCO) involving injection of an alkaline-activated sodium persulfate solution through a series of injection wells located beneath the main building and along the exterior of the southern portion of the main building to treat soil and groundwater contamination;
- Excavation of remaining contaminated soil beneath and adjacent to the main building that are determined to be impacting the ability to achieve the groundwater Remedial Action Objectives (RAOs), subsequent to treatment with ISCO and after a determination is made by EPA that it is not inappropriate to access the material based upon factors including the use of the building;
- Additional sampling during the pre-remedial design phase to determine whether an upgradient source of groundwater contamination is present in the northern portion of the Alcas Facility or off-property;
- Institutional controls for soil and groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. A plan will be developed which specifies institutional controls to restrict exposure to hazardous substances (e.g. via groundwater consumption, contact with contaminated groundwater, and contact with contaminated soil) until RAOs are met which are anticipated to include proprietary controls, such as deed restrictions for groundwater and soil use, existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies regarding groundwater use in the impacted area;
- Implementation of a long-term groundwater monitoring program to track and monitor changes in the groundwater contaminant levels to ensure the RAOs are attained. The sampling program will also monitor groundwater quality including degradation by-products generated by the treatment processes to ensure that drinking water quality standards are met at the nearby municipal water supply well 18M and to address the potential for migration of vapors from groundwater to indoor air at the Alcas Facility that could result from the ISCO treatment. The results from the long-term monitoring program will be used to evaluate the migration and changes in VOC contaminants over time; and
- Development of a site management plan (SMP) to provide for the proper management of the Site remedy post-construction, including through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews and certifications. The SMP will also provide for the proper management of any

contaminated unsaturated soils remaining beneath the concrete slab of the building and the evaluation of the potential for soil vapor intrusion should the building use at the Alcas Facility change or for any buildings developed on the Alcas Facility.

The major components of the selected remedy for Parcel B include the following:

- Enhanced anaerobic bioremediation (EAB) to promote reductive dechlorination of contamination through a series of injection wells to degrade organic contaminants;
- Institutional controls for groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. A plan will be developed which specifies institutional controls to restrict exposure to hazardous substances until RAOs are met which are anticipated to include proprietary controls, such as deed restrictions for groundwater use, existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies regarding groundwater use in the impacted area;
- Implementation of a long-term groundwater monitoring program to track and monitor changes in the groundwater contamination to ensure the RAOs are attained. The sampling program will also monitor groundwater quality including degradation by-products generated by the treatment processes to ensure that drinking water quality standards are met at the nearby municipal water supply well 18M. The results from the long-term monitoring program will be used to evaluate the migration and changes in VOC contaminants over time; and
- Development of an SMP to provide for the proper management of the Site remedy post-construction, including through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews and certifications. The SMP will also provide for the evaluation of the potential for soil vapor intrusion for any buildings developed on Parcel B.

The environmental benefits of the selected amended remedy for the Alcas Facility and the selected remedy for Parcel B may be enhanced by employing design technologies, considerations and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.¹

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy for OU3 and the amended OU2 remedy meet the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. § 9621, in that they: 1) are protective of human health and the environment; 2) meet a level or standard of control of the hazardous substances, pollutants, and contaminants which at least attains the legally applicable or relevant and appropriate requirements under federal and State laws (unless a statutory waiver is justified); 3) are cost-effective; and 4) utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The remedies also satisfy a preference for treatment as a principal element of the remedy (i.e., it reduces the toxicity, mobility, or volume

¹ See http://epa.gov/region2/superfund/green_remediation.

of hazardous substances, pollutants, or contaminants as a principal element through treatment) through the use of ISCO at the Alcas Facility and EAB at Parcel B.

These remedies will result in hazardous substances, pollutants, or contaminants at levels that will not allow for unrestricted use and unlimited exposure until performance standards are attained, and as such, use and exposure must be limited until standards are met. Since it may take more than five years to attain the cleanup levels, policy reviews pursuant to Section 121(c) of CERCLA will be conducted no less often than once every five years after the completion of construction to ensure that the remedy is, or will be, protective of human health and environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this OU3 ROD and OU2 ROD Amendment. Additional information can be found in the Administrative Record for this Site.

- ✓ A discussion of the current nature and extent of soil and groundwater contamination is included in Section 6;
- ✓ Chemicals of concern and their respective concentrations may be found in Section 8 “Summary of Site Risks” and Table 7 in Appendix II;
- ✓ Potential adverse effects associated with exposure to Site contaminants may be found in Section 8 “Summary of Site Risks”;
- ✓ A discussion of cleanup levels for chemicals of concern may be found in Section 9 “Remedial Action Objectives” and in Table 7 in Appendix II;
- ✓ A discussion of principal threat waste is contained in Section 12 “Principal Threat Wastes”;
- ✓ Current and reasonably-anticipated future land use assumptions are discussed in Section 7 “Current and Potential Future Land and Resources Uses”;
- ✓ Estimated capital, annual operation and maintenance, and total present worth costs are discussed in Section 10 “Descriptions of Alternatives”; and
- ✓ Key Factors in detailed analyses of viable remedial alternatives (*e.g.*, how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) may be found in Section 11 “Comparative Analysis of Alternatives” and Section 13 “Statutory Determinations.”

AUTHORIZING SIGNATURE

Walter E. Mugdan, Director
Emergency and Remedial Response Division

Date
Date

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DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Olean Well Field Superfund Site (Site) is located in the eastern portion of the City of Olean and west and northwest of the towns of Olean and Portville in Cattaraugus County, New York. The Site is characterized by contaminated groundwater encompassing an area approximately 800 acres underlying the City of Olean, the Town of Olean and the Town of Portville, and by contaminated soil at certain locations in the City and Town of Olean. The Site is approximately 65 miles southeast of Buffalo, New York, and seven miles north of the New York/Pennsylvania border. The Allegheny River, a principal tributary of the Ohio River, and two of its tributaries, the Olean and Haskell Creeks, flow west-northwest through the southern portion of the Site. A Site location map is provided as Figure 1 in Appendix I.

EPA has divided the Site into separate phases, or operable units, for remediation purposes. Operable Unit 1 (OU1) addresses the drinking water supply for the City and Town of Olean. OU2 addresses the sources of VOC contamination to groundwater. Investigations, conducted to date, identified four source areas of VOC contamination to groundwater at the Site: Alcas Cutlery Corporation (Alcas), Loohn's Dry Cleaners and Launderers (Loohn's), McGraw-Edison Company (McGraw) and AVX Corporation (AVX). The Alcas source area includes the real property at which Alcas formerly conducted manufacturing operations, located at 1116 East State Street, which is currently occupied by the Cutco Corporation (this facility is hereafter referred to as the Alcas Facility). The Alcas source area also includes several parcels of land to the south of the Alcas Facility identified on the City of Olean tax map as Block 2, Lots 23, 24 and a portion of Lot 44 that were recently determined to be impacted by contaminated groundwater (collectively, these parcels are hereafter referred to as Parcel B). OU3 has been developed to address groundwater contamination at Parcel B. The Alcas Facility and Parcel B hereafter constitute the Alcas Source Area.

This Record of Decision (ROD) for Operable Unit 3 (OU3) and ROD Amendment for OU2 addresses soil and groundwater contamination for the Alcas Source Area. A map of the Alcas Source Area is provided as Figure 2 in Appendix I.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

Three municipal water supply wells (18M, 37M and 38M) at the Site (see Figure 1) were constructed and completed in the late 1970s to provide water for the City of Olean, New York. The supply wells draw water from a water-bearing zone known as the City Aquifer. Prior to the construction of these municipal wells, city water was supplied by a surface-water treatment facility which drew water from the Olean Creek. In 1981, these supply wells were found to contain trichloroethene (TCE) and other chlorinated organic solvents at concentrations exceeding federal maximum contaminant levels (MCLs) and drinking water standards set by the New York State Department of Health (NYSDOH). As a result, these wells were closed and the surface water treatment facility operations were reactivated to provide water to residents.

EPA subsequently evaluated the Site for inclusion on the National Priorities List (NPL) of

known or threatened releases of hazardous substances. As a result of this evaluation, the Site was included on the National Interim Priorities List, by publication in the Federal Register on October 23, 1981, and was included on the first NPL on September 9, 1983.

Following the discovery by the Cattaraugus County Department of Health and the NYSDOH that a number of private wells in the City and Town of Olean, all of which received groundwater from a portion of the water-bearing zone above the City Aquifer, known as the upper aquifer were also contaminated with TCE. EPA performed an initial removal action in January 1982. This action involved the installation of carbon adsorption filters on 16 contaminated private wells in the City and Town of Olean and periodic monitoring of those wells. In June 1984, EPA conducted a second removal action which included the replacement of one of the carbon filters installed as part of the initial removal action, installation of carbon units on ten additional contaminated private wells, and monitoring. In March 1985, EPA conducted a third removal action which consisted of the installation of carbon filter systems on two additional homes.

Between 1981 and 1985, several separate federal-, state- and potentially responsible party (PRP)-led investigations were conducted to identify the sources of contamination to the municipal wells and evaluate the nature and extent of groundwater contamination at the Site.

The results of these investigations were documented in a first operable unit ROD (OU1 ROD) for the Site issued by EPA on September 24, 1985. The OU1 ROD called for the following: 1) installation of an air stripper to treat the contaminated groundwater from municipal water supply wells 18M, 37M and 38M; 2) extension of the City of Olean's public water supply line into the Town of Olean to connect approximately 93 residences served by private wells; 3) inspection of an industrial sewer; 4) recommendations for institutional controls to restrict the withdrawal of contaminated groundwater; 5) institution of a Site Monitoring Plan; and, 6) performance of a supplemental Remedial Investigation/Feasibility Study (RI/FS) to evaluate source control measures at all facilities that were contributing to the groundwater contamination.

On February 7, 1986, EPA issued an administrative Order under Section 106(a) of CERCLA, 42 U.S.C. §9606, (OU1 UAO) to AVX, McGraw-Edison Company, Cooper Industries, Inc. (parent corporation of McGraw-Edison Company), Alcas, Aluminum Company of America (which at the time owned a percentage share of Alcas), and W.R. Case and Sons Cutlery Co. (Case) (which at the time owned the remaining percentage share of Alcas), requiring them to implement the remedial action selected in the OU1 ROD.

All of the PRPs, with the exception of Case, agreed to perform the actions pursuant to the OU1 UAO. Case subsequently filed for bankruptcy. The trustee in bankruptcy for the bankruptcy estate of Case entered into a consent decree with the United States which required the bankruptcy estate to pay a portion of EPA's past costs and a penalty for Case's failure to comply with the OU1 UAO.

Pursuant to the OU1 UAO, the extension of the City of Olean's water line was completed in 1988. In 1989, the private well users were connected to the water line extension. Although all residents impacted by the Site were offered connection to the public water supply pursuant to the OU1 ROD, some refused and, to date, some residents continue to use private wells as a source of potable water. Also in 1989, the industrial sewer at the McGraw-Edison property was inspected and repaired. In February 1990, construction of the air strippers was completed and the municipal

well water supply service was reactivated. The current total pumping rate for the municipal wells is approximately 3 million gallons per day. Since the system began operating, treated water from the air strippers has met State and federal drinking water standards.

On November 13, 1989, EPA issued an additional administrative order to Alcas. The order required Alcas to excavate approximately 10 cubic yards of contaminated soil from an area at the Alcas Facility where TCE had previously been used as a weed killer. This work was completed in 1989.

On June 25, 1991, an administrative order on consent was entered into between EPA and AVX, McGraw-Edison, Cooper Industries, Alcas and Alcoa, Inc. (formerly known as Aluminum Company of America) for performance of a supplemental (OU2) RI/FS. The supplemental RI/FS was a mixed work project. Pursuant to this administrative order, the PRPs were required to investigate their respective properties. In addition, EPA conducted studies on 10 additional properties. The results from the investigations conducted by EPA were provided to the PRPs for incorporation into the supplemental RI/FS. In addition to the AVX, Alcas and McGraw-Edison properties, the supplemental RI/FS identified the Loohn's property as an additional source area.

Based on the results of the supplemental RI/FS, EPA issued a ROD for OU2 on September 30, 1996. The major components of the selected remedy for OU2 for the Alcas property included the following:

- Vacuum Enhanced Recovery (VER) of VOCs from contaminated soil;
- Upgradient and downgradient groundwater monitoring; and
- Implementation of groundwater use restrictions.

The major components of the selected remedy for the Loohn's property included the following:

- VER or Soil Vapor Extraction with air sparging (SVE/AS). If design studies indicated VER and SVE/AS were impracticable due to the influence of the Allegheny River, the source area would be excavated;
- Upgradient and downgradient groundwater monitoring;
- Implementation of groundwater treatment if VER and SVE/AS or excavation do not adequately improve the quality of the City Aquifer, and if the Loohn's property continued to affect the groundwater entering the municipal wells; and
- Implementation of groundwater use restrictions.

The major components of the selected remedy for the McGraw-Edison property included the following:

- Groundwater treatment;
- Upgradient and downgradient groundwater monitoring; and
- Implementation of groundwater use restrictions.

The major components of the selected remedy for the AVX property included the following:

- Excavation and removal of contaminated soil;

- Off-Site low temperature desorption of soil contaminants, if necessary;
- Upgradient and downgradient groundwater monitoring;
- Implementation of groundwater treatment, if excavation and removal of the contaminated soil did not adequately improve the quality of the City Aquifer and if the property continued to affect the groundwater entering the municipal wells; and
- Implementation of groundwater use restrictions.

Implementation of the OU2 ROD

On March 17, 1998, three consent decrees were entered by the United States District Court for the Western District of New York. Each Consent Decree required either McGraw Edison and Cooper Industries, Alcas and Alcoa, or AVX to perform the remedial design and remedial actions for their respective property as specified in the OU2 ROD. The remedial action for the Loohn's property was performed by EPA.

McGraw-Edison - Cooper Industries:

Construction of a groundwater pump and treatment system for the contaminated upper groundwater aquifer at the McGraw-Edison property was initiated in 1999. In July 2001, operation of the groundwater treatment system commenced. The treatment system consists of two extraction wells with an average combined pumping rate of 20 gallons per minute (gpm) from the impacted upper groundwater bearing zone, a shallow tray air-stripper to remove VOCs from the extracted groundwater and a reinjection well to return treated water to the City Aquifer.

Loohn's Dry Cleaners and Launderers:

In the absence of a viable PRP, EPA funded the implementation of the components of the selected remedy at the Loohn's property. A remedial design study was completed in 1998 by EPA and based on this study, EPA elected to implement the soil excavation option of the selected OU2 remedy in lieu of VER or SVE/AS.

In 2000, EPA initiated the soil excavation activities and approximately 3,000 cubic yards of soil contaminated with tetrachloroethylene (PCE) and other VOCs were excavated and disposed of off-Site. After soil excavation activities commenced, additional data collected at the property revealed that the quantity of soil requiring excavation significantly exceeded the estimated design quantity. As a result, an additional 4,000 cubic yards of contaminated soil, was excavated and, along with the debris from the demolished remains of an old building on the property, disposed of off-Site.

Sampling of the groundwater monitoring wells at the Loohn's property have continued to reveal elevated concentrations of VOCs in groundwater. During the most recent sampling conducted in April 2012, TCE and PCE were detected at concentrations of 320 parts per billion (ppb) and 2,600 ppb, respectively. EPA is in the process of determining whether further investigation at the Loohn's property is warranted.

AVX:

AVX initiated the excavation of contaminated soils at its property in July 2000. Approximately 5,055 tons of contaminated soil was excavated to a depth of approximately 10 feet below grade surface and transported off-Site for disposal before work was halted. AVX could not complete the excavation of contaminated soil because contaminated soil were beneath the southeast corner of the manufacturing building, which was fully occupied with AVX's manufacturing operations, and further excavation had the potential to impact the structural integrity of the occupied building. As a result, the excavation area was backfilled pending further study. Due to the discovery of the presence of elevated TCE concentrations under the building, AVX has been conducting further investigations and studies with EPA oversight. EPA expects to issue a Proposed Plan for Remedy Modification for the AVX property in the near future.

Alcas:

A summary of the OU2 ROD implementation at the Alcas Source Area is discussed in Section 6, below.

4. COMMUNITY PARTICIPATION

On July 23, 2014, the EPA released the Proposed Plan for cleanup of the Alcas Source Area of the Site to the public for comment. The EPA assembled supporting documentation, which comprises the administrative record, and has made it available to the public at the information repositories maintained at the Olean Public Library located at Second and Laurens Streets, Olean, New York, and the EPA Region 2 Office in New York City.

Notice of the July 23, 2014 start of the public comment period and the availability of the above-referenced documents was published in *The Olean Times Herald* on July 23, 2014. A copy of the public notice published in *The Olean Times Herald* can be found in Appendix V. The EPA accepted public comments on the Proposed Plan from July 23, 2014 through August 22, 2014.

On August 5, 2014, the EPA held a public meeting at the Jamestown Community College, Cattaraugus County Campus, in the Cutco Theatre, located at 260 North Union Street, Olean, New York, to inform local officials and interested citizens about the Superfund process, to present the Proposed Plan for the Alcas Facility and Parcel B, including the preferred proposed remedial alternatives, and to respond to questions and comments from the attendees. Responses to the questions and comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary (See Appendix V). No comments received during the comment period expressed disagreement with the EPA's preferred alternatives.

5. SCOPE AND ROLE OF RESPONSE ACTION AT ALCAS SOURCE AREA

Section 300.5 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Section 300.5, defines an OU as a discrete action that comprises an incremental step toward comprehensively addressing a site's problems. A discrete portion of a remedial response eliminates or mitigates a release, a threat of release, or pathway of exposure. Cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with the site.

EPA has designated four OUs for the Olean Well Field Site. OU1 addresses the drinking water supply for the City and Town of Olean and the extension of the public water supply to residents utilizing private wells. OU2 addresses the sources of VOC contamination to groundwater, specifically: Alcas, Loohn's, McGraw and AVX. OU3 addresses groundwater contamination at Parcel B. EPA is in the process of designating a fourth OU (OU4) which will address a source of VOC contamination to groundwater located south of the AVX property. EPA expects to begin a preliminary study of this area in the near future.

Additional evaluations performed by the Alcas Source Area PRPs (Alcas and Alcoa), after the issuance of the OU2 ROD, revealed that a major component of the OU2 selected remedy for the Alcas Source Area, VER of VOCs, would not be successful and was, therefore, not protective of human health and the environment. As a result, modification to the Alcas Source Area component of the OU2 ROD is necessary. These investigations also revealed the presence of high levels of TCE in groundwater at Parcel B, necessitating the designation of Parcel B as a third operable unit and the issuance of this OU3 ROD.

The primary objectives of the actions set forth in this OU3 ROD and OU2 ROD Amendment are to minimize, contain and/or eliminate the migration of contaminants in soil and groundwater and to minimize any potential future health and environmental impacts at and from the Alcas Source Area.

This OU3 ROD and OU2 ROD Amendment does not modify the selected remedy for OU1 nor the OU2 remedy for the Loohns, McGraw, or AVX source areas. EPA anticipates that a modification to the AVX property component of the OU2 ROD will be necessary and a subsequent Proposed Plan and ROD Amendment will be issued to address the modification.

6. SUMMARY OF ALCAS SOURCE AREA CHARACTERISTICS

6.1 Site Geology/Hydrogeology

The Olean Well Field is underlain by approximately 300 feet of unconsolidated glacial deposits. Previous groundwater investigations in the Olean Well Field have shown that the upper 100 feet of glacial deposits can be divided into five lithologic units based on color, texture, grain size and mode of deposition. These lithologic units have been grouped in topographically descending order into four hydrogeologic units referred to as the upper aquifer, upper aquitard, lower aquifer, and lower aquitard.

The upper aquifer is comprised of glaciofluvial coarse sands and sandy gravels, recent fluvial deposits of fine sands, and silts with some clay. The upper aquifer is not continuous at the Olean Well Field. The thickest portion of the upper aquifer (approximately 41 feet) is found along the Allegheny River. The upper aquifer thins to the north, pinching out just south of the AVX property. The upper aquifer is recharged by the infiltration of precipitation. Groundwater in the upper aquifer is generally encountered at a depth of approximately 12 to 15 feet below land surface and flow is toward the Allegheny River.

The upper aquitard is located above the lower aquifer. This unit is a low permeability lodgement till composed of greater than 50 percent silt and clay. The thickness of the upper aquitard at the Olean Well Field Site ranges from as little as six feet in the south to over 30 feet in the north. In

the northern portion of the Site this unit is present at the surface and consists of surficial till.

The lower aquifer, also referred to as the City Aquifer, consists of glacial outwash deposits of sand, silt, and gravel. The thickness of the lower aquifer is approximately 70 feet in the northern portion of the Site and thins to approximately 30 feet south of the Allegheny River to the south. The lower aquifer is the main source of drinking water for the City and Town of Olean. In addition several industrial facilities in the area utilize wells completed in the lower aquifer for manufacturing activities. The regional groundwater flow within the City Aquifer is generally in a west-southwest direction but within the vicinity of the Alcas Facility a localized eastward flow occurs due to the pumping influence of a nearby municipal supply well (18M).

Recharge to the lower aquifer is via leakage from the upper aquifer (or till where the upper aquifer is not present) through the upper aquitard. The magnitude of leakage over the Olean Well Field Site is variable and is dependent on the thickness and permeability of the till (upper aquitard) and relative groundwater level differences between the upper aquifer (or till) and lower aquifer.

The lower aquitard has been described as silt, clay, and fine to very fine sand deposited in a preglacial environment. Groundwater level data and potentiometric surface maps indicate that lines of equal elevation for the upper aquifer generally parallel the Allegheny River. This indicates that groundwater flow is towards the river from both sides of the river valley. Natural flow conditions in the lower or City Aquifer within the vicinity of the Site have been altered by the pumping of the municipal wells, in operation since 1985, and an AVX production well, in operation since 1959.

6.2 Unknown Conditions or Information Related to Alcas Source Area

In 1999, the PRPs associated with the Alcas Facility initiated a series of property-specific pre-design investigations that involved further characterization studies necessary to design the VER component of the selected remedy. Based upon the initial results of these studies, it was determined that geological conditions in the till unit are heterogeneous and the source of groundwater contamination was not from the shallow soil at the rear of the Alcas Facility as identified in the OU2 ROD, but rather the data suggested that the main source of contamination resided beneath the main manufacturing building at the Alcas Facility. Based on this new information, the PRPs conducted further investigations in 2001 to support their belief that a residual dense non-aqueous phase liquid (DNAPL²) source is located under the main manufacturing building. In September 2001, the PRPs installed and sampled 17 microwells to define the direction of groundwater flow, to verify that affected groundwater is migrating from under the main manufacturing building, and to delineate the downgradient extent of shallow groundwater contamination. The investigation showed that elevated concentrations of TCE (16,000 to 310,000 ppb) were detected in groundwater samples collected in the upper aquifer along the southern edge of the main building. The presence of TCE in groundwater at these concentrations is typically recognized by EPA as an indicator of the presence of residual DNAPL. DNAPL in soil represents a slowly dissolving source of groundwater contamination, prolonging groundwater restoration.

² A dense non-aqueous phase liquid or DNAPL is a liquid that is both denser than water and is immiscible or has low solubility in water.

Based on this data, in February 2003, EPA informed the PRPs that further Site investigation and characterization studies were warranted. The studies were needed to delineate the extent of the groundwater contamination in the upper aquifer beyond the southern boundary of the Alcas Facility (Parcel B) and to confirm the presence of a residual DNAPL source beneath the main manufacturing building.

As part of the additional investigation, in July 2004 soil and groundwater samples were collected from beneath and to the southwest of the main building and from the underlying City Aquifer to further determine the nature and extent of the VOC contamination in soil, shallow till and groundwater bearing zones at and downgradient of the Alcas Facility.

Soil/DNAPL Assessment Summary

Varying concentrations of VOCs were detected in the soil samples collected from the borings installed within the main manufacturing building. Results from the investigation showed concentrations of TCE as high as 280 parts per million (ppm), confirming the presence of residual DNAPL in the soil/till zone at an approximate depth of nine feet below the foundation of the main building. This concentration represents the highest concentration of TCE detected in soil at the Alcas Facility.

6.3 Groundwater Assessment Summary

The pre-design investigation groundwater sampling results for the upper aquifer revealed TCE concentrations ranging from nondetect to 310,000 ppb for the wells around the southeast corner of the main manufacturing building at the Alcas Facility. This indicates that a DNAPL source exists at or upgradient of this location, placing the likely source of DNAPL under the building. Generally, groundwater concentrations in the upper aquifer decrease from the building toward the river, which is the direction of groundwater flow.

Groundwater sampling results from five monitoring wells installed in the upper portion of the City Aquifer at the Alcas Facility revealed a maximum TCE concentration of 1,300 ppb at a depth of approximately 30 feet below the ground surface. Five additional monitoring wells were also installed at the Alcas Facility to further assess groundwater quality in the lower portion of the City Aquifer. TCE was detected at a maximum concentration of 10 ppb near the bottom of the City Aquifer at an approximate depth of 90 feet, exceeding the MCL of 5 ppb, which is the selected groundwater cleanup level in the OU2 ROD.

The results of these additional investigations confirmed the presence of a residual DNAPL source beneath the main manufacturing building at the Alcas Facility. Furthermore, the additional investigations revealed that groundwater contamination in the upper aquifer extends beyond the Alcas Facility limits. Groundwater sampling results from groundwater monitoring wells installed downgradient of the Alcas Facility revealed a maximum TCE and cis-1,2-dichloroethene (cis-1,2 DCE) concentration of 2,800 ppb and 1,000 ppb, respectively, at a depth of approximately 30 feet below the ground surface. Alcoa has since purchased the property south of the Alcas Facility overlying the contaminated groundwater plume (Parcel B).

6.4 Vapor Intrusion Investigation Summary

EPA investigates the soil vapor intrusion pathway at homes and buildings situated at Superfund sites when the potential for vapor intrusion exists. VOC vapors released from contaminated groundwater and/or soil have the potential to move through the soil and seep through cracks in basements, foundations, sewer lines and other openings.

In April 2009, EPA initially conducted vapor intrusion sampling at 36 residences and commercial buildings near each of the four source areas at the Site. Although EPA initially targeted additional properties near each of the source areas for vapor intrusion sampling based on their proximity to the underlying groundwater contamination, permission to perform the sampling was not received from all of the property owners. Where permission was granted, EPA drilled through the sub-slabs in the basements and installed ports in order to sample the soil vapor under the buildings. Sampling devices called Summa canisters were attached to these ports to collect air at a slow flow rate over a 24-hour period. Summa canisters were also placed in indoor areas in each structure, and outside several residences to determine if there were any outdoor sources that may impact indoor air. The Summa canisters were then collected and sent to a laboratory for analyses.

The analytical results of the April 2009 vapor intrusion sampling indicated that nine homes and one commercial building had concentrations of VOCs at or above EPA Region 2 screening levels in sub-slab vapor gases. However, all locations tested showed no concentrations of vapor intrusion gases in the indoor air of these locations above EPA health-based levels.

In 2010 and 2011, EPA re-tested seven of the homes where permission was granted and one commercial establishment for the presence of vapor intrusion gases in both the sub-slab and indoor air. The data gathered revealed a declining trend in concentrations of vapor gases in the sub-slab of the retested homes. The commercial building located near the McGraw-Edison property showed TCE concentrations in the sub-slab vapor gas at 350 micrograms per cubic meter (ug/m^3) in 2009, 250 ug/m^3 in 2010, and nondetect in 2011. This building was retested in 2012 and 2014 and showed concentrations of TCE in the subslab gas at 512 ug/m^3 and 443 ug/m^3 , respectively. However, no vapor intrusion constituents above health-based levels were detected in the indoor air. Based on the presence of elevated concentrations of TCE in the subslab gas, EPA intends to continue performing vapor intrusion monitoring.

In April 2011, EPA performed an additional study in an area southwest of the Alcas Facility, and soil and groundwater samples were collected along Billington and Taggerty Avenues to, among other things, determine whether this area could be potentially impacted by vapor intrusion. The results did not reveal Site-related contamination in the soil samples. TCE was present in the groundwater at low levels (maximum concentration of 3.52 ppb).

Based on EPA's investigation, the vapor-intrusion pathway was determined not to constitute a significant risk to human health or the environment.

7. CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

7.1 Land Use

The Alcas Facility is situated within a designated industrial zone in the City of Olean. Farming and agriculture are nonexistent within the general vicinity. Parcel B is comprised of several residential

parcels of land, acquired by Alcoa, immediately to the south of the Alcas Facility. Parcel B is bordered to the east and west by sparsely populated residential areas, and to the south by the Allegheny River, a principal tributary of the Ohio River, which flows west-northwest through the southern portion of the Site. EPA expects that the land-use pattern at and surrounding both the Alcas Facility and Parcel B will not change.

7.2 Groundwater Use

Three municipal water supply wells (18M, 37M and 38M) at the Site provide water for the City of Olean. These water supply wells draw water from the City Aquifer. An air stripper at municipal supply well 18M and a separate air stripper at municipal supply wells 37M and 38M treat the extracted groundwater before distribution to the public. The current total pumping rate for these municipal wells is approximately 3 million gallons per day. In addition, although the extension of the City of Olean's water line was completed in 1988, and in 1989 private well users were connected to the water line extension, to date, some residents continue to use private wells as a source of potable water.

8. SUMMARY OF SITE RISKS

A baseline human health risk assessment (HHRA) was conducted in 1995 as part of the OU2 ROD to estimate the risks associated with current and future site conditions at the Alcas Facility and a qualitative human health risk was performed in 2014 to assess potential risks at Parcel B. A baseline or qualitative human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous substance exposure in the absence of any actions to control or mitigate exposure under current and future land uses.

8.1 Human Health Risk Assessment Process

The HHRA performed as part of the OU2 RI considered exposure to chemicals of potential concern (COPCs) at the Site. The qualitative human health risk assessment for OU3 considered exposure to COPCs at Parcel B. As required by EPA policy, these assessments estimated the human health risk which could result from the contamination at the Site if no remedial actions were taken at the Alcas Facility or Parcel B. Tables 1 through 6 in Appendix II present the relevant subset of information from the HHRA.

For the OU2 HHRA, a four-step human health risk assessment process was used for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of:

Hazard Identification – this step identifies the COPCs at a site based on several factors such as toxicity, frequency of occurrence, and concentration;

Exposure Assessment – this step estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed (i.e., ingestion and dermal contact with contaminated soil);

Toxicity Assessment – this step identifies the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and

Risk Characterization – this step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. During this step, contaminants with concentrations that exceed federal Superfund guidelines for acceptable exposure are identified. These guidelines are 10^{-4} to 10^{-6} , or one-in-ten-thousand to one-in-a-million excess occurrences for cancer, and a Hazard Index (HI) of greater than 1.0 (discussed further below) for noncancer health hazards. Contaminants with concentrations that exceed these guidelines are then considered chemicals of concern (COCs) for a site and are typically those that will require remediation. The uncertainties associated with the risk calculations are also evaluated under this step.

8.2 Human Health Risk Assessment

The risk assessment that was conducted to support the remedial decision for the OU2 ROD evaluated the potential risks and hazards that may be associated with exposure to groundwater contamination at the Site through ingestion, dermal contact and inhalation of vapors during showering.

The results of the baseline risk assessment performed for OU2 indicated that ingestion of and dermal contact with untreated groundwater at the Site posed unacceptable risks to human health. The baseline risk assessment evaluated all Site-related contaminants, however the estimated total risks are primarily due to TCE and TCA. Cancer risks due to ingestion of groundwater were determined to be approximately one-in-one-hundred for adults and young children (1.49×10^{-2} and 1.3×10^{-2} , respectively) and six-in-one-thousand (5.94×10^{-3}) for older children. The noncarcinogenic HIs for these exposure groups were 3.36 for adults, 14.7 for young children and 6.73 for older children. Cancer risks due to dermal contact with groundwater contaminants were determined to be 2.35×10^{-3} for adults, 9.21×10^{-4} for young children and 6.68×10^{-4} for older children. The noncarcinogenic HIs for these exposure groups were less than one.

Cancer and noncancer risks due to inhalation of contaminants from untreated groundwater during showering were within EPA's acceptable risk range. Cancer risks for adults were determined to be 6.38×10^{-5} for adults and 5.98×10^{-5} young children, and 2.73×10^{-5} for older children. The noncarcinogenic HIs for these exposure groups were less than one.

The cumulative upper-bound cancer risks for exposure through ingestion, dermal contact, and inhalation to untreated groundwater at the Site were 1.73×10^{-2} for adults, 1.39×10^{-2} for young children and 6.64×10^{-3} for older children, which are greater than the acceptable risk range of 10^{-4} to 10^{-6} . The estimated total risks are primarily due to TCE, which contributed significantly to the carcinogenic risk calculations and was attributable to releases of the contaminant into the ground and eventually into the groundwater.

Although the baseline risk assessment performed for OU2 evaluated exposure to untreated groundwater for the four sources areas collectively, each COC detected at the Alcas Facility exceeded federal MCLs and State standards. The maximum concentration of TCE detected in groundwater during the OU2 RI at the Site was 110,000 ppb, compared to the federal MCL and

State standards of 5 ppb. Although the OU2 RI had revealed a maximum concentration of 8,800 ppb for TCE at the Alcas Facility, additional data collected subsequent to the OU2 ROD revealed a maximum concentration of 310,000 ppb for TCE at the Alcas Facility. Therefore, based on the data collected to date, the results of the baseline risk assessment contained in the OU2 ROD for groundwater have not substantially changed.

Cancer risks and noncarcinogenic hazards from exposure to surface and subsurface soils through ingestion or inhalation by construction workers were also evaluated for the OU2 ROD. Cancer risks were found to be acceptable for the Alcas Facility. Noncarcinogenic HIs were less than 1, and as such, found to be acceptable at the Alcas Facility. A residential exposure scenario for soil was not calculated because all of the properties studied during the OU2 RI/FS are zoned for and operated as either industrial or commercial uses.

Investigations conducted at the Alcas Facility subsequent to the OU2 ROD revealed concentrations of TCE in soils beneath the main building that were higher than the concentrations in soil used for the OU2 Risk Assessment. These investigations revealed a maximum concentration of TCE of 280 ppm at a depth of nine to ten feet below the concrete slab floor of the main building, compared to a maximum TCE concentration of 12 ppm detected in soil prior to the issuance of the OU2 ROD. As part of the remedy modification process, EPA has conducted a qualitative analysis of the data to estimate the risks associated with the elevated TCE concentrations detected in soils at the Alcas Facility. The Alcas Facility is zoned for and operated as either industrial or commercial uses and it is expected that such use would continue in the future. Because the higher concentrations of TCE is at depth (i.e., 10 feet deep or greater), the exposure pathway to the contamination is not complete. Therefore, based on this qualitative analysis considering current and anticipated site use, EPA has determined that the higher concentrations of TCE in soils at depth beneath the main building have not substantially changed the results of the baseline risk assessment contained in the OU2 ROD for soils at the Alcas Facility. Discovery of the higher soil concentrations below the Alcas building, while not impacting the potential risk and hazards due to depth, could serve as a source material for continued groundwater contamination and therefore it is prudent to address the deep soil contamination in relation to the groundwater remedy.

As to Parcel B, additional groundwater and soil investigations were conducted at Parcel B, after the OU2 ROD was issued. The data collected from these investigations found that maximum TCE concentrations in groundwater under Parcel B (2,800 ppb) was within an order of magnitude of the maximum groundwater concentration found under the Alcas Facility during the OU2 RI (8,800 ppb), which indicates that the risks and hazards for exposure to groundwater under Parcel B would be similar to those calculated for the Alcas Facility. The data collected from the soil investigations at Parcel B did not reveal Site-related contamination in soils.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling

- exposure parameter estimation
- toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled. Uncertainties in the exposure assessments are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure could occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure. Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals.

These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Risk Assessment provides upper-bound estimates of the risks to populations near the site, and is unlikely to underestimate actual risks related to the site.

8.3 Ecological Risk Assessment

The Alcas Facility and Parcel B are located within the developed industrial zone of the City of Olean. The Alcas Facility main building is surrounded by asphalt and some limited patches of lawn. Parcel B is a vacant area of land to the immediate south. Parcel B is covered with grass and is surrounded by residences. There are no significant habitats present at the Alcas Facility which could potentially support indigenous wildlife receptor species. At Parcel B, there is no complete exposure pathway for any ecological receptors present because soils are not contaminated and groundwater contamination occurs at depth. An ecological risk assessment was not conducted as part of the OU2 investigations for the Alcas Facility or the OU3 site investigation process for Parcel B.

8.4 Basis for Taking Action

The results of the investigations and the human health risk assessments indicate that the contaminated groundwater at both the Alcas Facility and Parcel B presents an unacceptable exposure risk. The ecological evaluation indicates that the Alcas Facility does not pose any unacceptable risks to aquatic or terrestrial ecological receptors.

Discovery of the elevated concentrations of contaminated soil below the building at the Alcas Facility, while, due to their depth, do not impact the potential risk and hazards, they serve as source material for continued groundwater contamination and, therefore, it is necessary to address the soil contamination in relation to the groundwater remedy.

It is EPA's determination that selected remedies for the Alcas Facility and for Parcel B are necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

9.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

The RAOs for the Alcas Facility in the OU2 ROD were developed for two contaminated media – groundwater and soil. The RAOs are designed to, among other things, restore the upper and lower aquifers to their beneficial use as a source of drinking water. Groundwater objectives included the removal and/or control of the sources of contamination to the groundwater and the removal of contamination already in the groundwater.. The RAOs for the groundwater for the Alcas Facility (the OU2 ROD Amendment) are consistent with the OU2 ROD. The RAOs for the groundwater at Parcel B (the OU3 ROD) are the same as the RAOs for the Alcas Facility. The groundwater RAOs are as follows:

- Restore the City Aquifer beneath the Alcas Facility and Parcel B to its beneficial use as a source of drinking water by reducing contaminant levels to the more stringent of federal MCLs or New York State standards;
- Minimize, contain and/or eliminate sources of VOC contaminants already in the shallow groundwater at the Alcas Facility and Parcel B; and
- Minimize and/or eliminate the potential for future human exposure to site contaminants via contact with contaminated groundwater.

The groundwater remediation goals established for both the OU2 ROD Amendment and the OU3 ROD are identified in Table 7.

Soil objectives in the OU2 ROD include the elimination of leaching of contaminants of concern from the soil into the groundwater. The soil RAOs for the Alcas Facility for this OU2 ROD Amendment include:

- Minimize, contain and/or eliminate VOC contaminants from soils at the Alcas Facility that are leaching into the groundwater; and
- Minimize and/or eliminate the potential for human exposure to Site contaminants via contact with contaminated soil.

Soil remediation levels for addressing the Alcas Facility soil contamination are identified in Table 7.

10. SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site.

CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

The 1996 OU2 ROD evaluated five remedial alternatives to address the contamination at the Alcas Facility: 1) no action; 2) institutional controls and access control; 3) soil capping and groundwater treatment; 4) soil vapor extraction/VER and groundwater treatment; and 5) soil removal and groundwater treatment.

Pilot tests conducted at the Alcas Facility during the FS indicated that VER could effectively desorb VOCs from the contaminated subsurface at the Alcas Facility. However, in 2000, after the OU2 ROD was issued, Alcas and Alcoa petitioned EPA for a change of the VER component of the OU2 ROD, on the basis that the technology could not feasibly or effectively remediate a suspected DNAPL mass underneath the Alcas main building. The presence of DNAPL under the main manufacturing building was not known in 1994 when the pilot study was performed or in 1996 when the OU2 ROD was issued. In addition, further characterization of geological conditions revealed that subsurface conditions in the area of the pilot study were not representative of conditions at the Alcas Facility. The additional investigations conducted in 2000 and 2001 also revealed the groundwater contamination in the upper aquifer on Parcel B, which was similarly not known when the OU2 ROD was issued.

Following the additional characterization of the nature and extent of contamination at the Alcas Source Area, remedial technologies were evaluated by the PRPs as part of a Focused Feasibility Study (FFS) to address the Alcas Facility and Parcel B. The FFS Report was finalized in July, 2014.

The FFS process evaluated various technologies to remediate the contaminated soil and groundwater at the Alcas Source Area. As part of the screening process conducted for the FFS, pilot studies were conducted for some of the technologies.

Between August and October 2011, the PRPs conducted bench-scale treatability tests to evaluate

the effectiveness of activated sodium persulfate, to reduce concentrations of TCE in soil and groundwater at the Alcas Facility. Based on the positive results of this initial bench-scale treatability study, in April 2012, the PRPs performed an additional *in-situ* treatability pilot study to further evaluate the potential for chemical oxidation using activated sodium persulfate to reduce concentrations of TCE in soils at the Alcas Facility. The data from this study indicated that activated sodium persulfate can be effective in destroying TCE at the Alcas Facility.

In November 2011, the PRPs also initiated an *in-situ* Enhanced Anaerobic Bioremediation (EAB) pilot study to evaluate the effectiveness of bioremediation with bioaugmentation in groundwater at Parcel B. The pilot study revealed the successful distribution of the injected compounds within the aquifer and the maintenance of strong reducing conditions following injection.

The FFS Report evaluated ten remedial alternatives for the Alcas Facility and five remedial alternatives for Parcel B. EPA has further screened out several active remedial alternatives from the FFS Report including a limited excavation of impacted soils, groundwater extraction and treatment, monitored natural attenuation, zero valent iron (ZVI) treatment, permeable reactive barrier, and barrier wall containment. These alternatives are not discussed in this decision document because as separate alternatives they would not meet the RAOs for the Alcas Source Area. This decision document summarizes three alternatives from the FFS Report for consideration as a potential remedy for the soil and groundwater contamination at the Alcas Facility and three alternatives to remediate groundwater contamination at Parcel B. This decision document summarizes No Action (Alternative 1), VER (Alternative 2) which was the remedy selected in the OU2 ROD, and *in-situ* chemical oxidation (ISCO) with activated persulfate, with and without excavation (Alternatives 3a and 3b, respectively) to remediate soil and groundwater contamination beneath and adjacent to the main building at the Alcas Facility. Although additional evaluations revealed VER of VOCs would not be successful, for the purposes of the OU2 ROD Amendment, Alternative 2 was maintained for comparison purposes. To remediate groundwater contamination at Parcel B, this decision document evaluates No Action (Alternative 1), EAB (Alternative 4), and ISCO using ozone (Alternative 5). Detailed descriptions of these remedial alternatives can be found in the July 2014 FFS Report.

The construction time for each remedial alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any PRPs, or procure contracts for design and construction.

10.1 Description of Common Elements among Remedial Alternatives

All of the alternatives, with the exception of the no action alternative (Alternative 1), include common components. Alternatives 2 through 5 include long-term monitoring to ensure that groundwater quality improves following implementation of the given remedy until cleanup levels are achieved. The groundwater sampling would also monitor degradation by-products generated by the treatment processes to ensure that drinking water quality standards are met at the nearby municipal water supply well 18M. Alternatives 2 through 5 also include implementation of institutional controls for soil and groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. A plan would be developed which would specify institutional controls to restrict exposure to hazardous substances until RAOs are met which are anticipated to include proprietary controls, such as deed restrictions for groundwater and soil use, existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies regarding groundwater use in the impacted area. A site management plan (SMP) would be developed to provide for the proper management of the Site remedy post-construction, such as through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews and certifications. Until the RAOs are achieved, the SMP would also provide for the proper management of any contaminated unsaturated soils remaining beneath the concrete slab of the building and the evaluation of the potential for soil vapor intrusion should the building use at the Alcas Facility change or for any buildings developed on the Alcas Facility and Parcel B.

Additionally, because MCLs will take longer than five years to achieve under any of the active Alternatives, a review of conditions at the Site will be conducted no less often than once every five years until cleanup levels are achieved.

10.2 Description of Remedial Alternatives

Alternative 1: No Action (Considered for Both Alcas Facility and Parcel B)

<i>Capital Cost:</i>	\$0
<i>Annual Operation & Maintenance (O&M) Costs:</i>	\$0
<i>Present Worth Cost:</i>	\$0
<i>Construction Time:</i>	Not Applicable

The NCP requires that a “No Action” alternative be used as a baseline for comparing other remedial alternatives. Under this alternative, there would be no remedial actions conducted at the Alcas Source Area to control or remove soil and groundwater contamination. This alternative does not include monitoring or institutional controls. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, additional response actions might be implemented.

Alternative 2: Vacuum Enhanced Recovery (the OU2 ROD Remedy) (Considered for Alcas Facility Only)

<i>Capital Cost:</i>	\$338,000
<i>Annual Operation & Maintenance (O&M) Costs:</i>	\$100,000
<i>Present Worth Cost:</i>	\$1,400,000
<i>Construction Time:</i>	6 months

VER involves the use of negative air pressure, generated by a high powered vacuum pump, which is applied to a series of recovery wells to cause the movement of soil vapor and some groundwater towards the wells for recovery. The vapor recovery causes desorption (removal of contaminants which are adsorbed onto soil particles) and volatilization of VOCs by continuously removing contaminated vapors and forcing clean air into the contaminated areas. An off-gas treatment system using granular activated carbon (GAC) would be constructed and operated at the Alcas Facility to remove contaminants from the effluent which are above federal and NYS air emissions standards. Any groundwater recovered with the soil vapor would also be treated with GAC prior to discharge to a publicly owned treatment works (POTW).

This was the remedy selected in the OU2 ROD and is presented here again as a basis for comparing this remedy to the other alternatives. For the purpose of developing a conceptual design and cost estimate for comparison with other technologies in the FFS, the conceptual design for VER from the OU2 ROD was modified from a one-step application to an interceptor system whereby the technology would be utilized immediately downgradient of the DNAPL source beneath the main building and operate full time. Installation of the VER wells were assumed in the conceptual design for the FFS to be limited to the area outside of the main building on the Alcas Facility to mitigate disturbance to ongoing manufacturing operations. VER wells would be installed up to a depth of approximately 27 feet below ground surface (bgs) to

target the source material. An estimated remediation time frame of 30 years was used for developing costs associated with O&M activities.

Alternative 3a: *In-situ* Chemical Oxidation (ISCO) Using Persulfate (Considered for Alcas Facility Only)

<i>Capital & Periodic Injection Cost:</i>	\$783,000
<i>Annual Operation & Maintenance (O&M) Costs:</i>	\$82,994
<i>Present Worth Cost:</i>	\$1,101,000
<i>Construction Time:</i>	1- 2 years

This remedial alternative would involve the injection of an alkaline-activated sodium persulfate solution through a series of injection wells located beneath the main building at the Alcas Facility and along the exterior of the southern portion of the main building to treat the contamination. *In-situ* treatment using ISCO results in the transformation of the VOC contaminants into less harmful chemical compounds. Site-specific bench-scale tests with alkaline-activated sodium persulfate were found to be successful, and this treatment chemical was assumed, for cost-estimating purposes; however, other ISCO treatment methods could also be employed as part of this remedial alternative. For the purposes of developing a conceptual design and cost estimate for comparison with other technologies, the FFS estimated that eight injection wells would be installed. Due to possible accessibility constraints for drilling equipment within the main building, the conceptual design may need to incorporate measures to mitigate disturbance to the facility operations. Figure 2 provides the conceptual design for the injection well network. The FFS also estimated three injection events over a period of up to five years. The conceptual design and cost estimate are based on the results of pilot studies conducted at the Alcas Facility using ISCO. The actual cost of this alternative depends on numerous factors, including the number of injections and the percentage of contaminant mass remaining upon completion of each injection event. This alternative would require additional sampling during the pre-remedial design phase to determine whether an upgradient source of groundwater contamination is present in the northern portion of the Alcas Facility or off-property. Based on the results of this additional pre-design investigation, the conceptual design may require some modification to address any source identified. This alternative assumes that any upgradient source impacting the Alcas Facility would be identified and effectively remediated or controlled.

This alternative would include long-term monitoring of the VOC contamination transformation resulting from the ISCO injections and the attenuation processes to ensure that the groundwater quality improves until the cleanup levels identified in Table 1 are achieved. Additional injections beyond the initial rounds outlined in the conceptual design may be required to achieve and maintain the remedial action. An estimated remediation time frame of 20 years was used for developing costs associated with O&M activities, including well maintenance and groundwater monitoring of the attenuation processes.

Alternative 3b: *In-situ* Chemical Oxidation (ISCO) Using Persulfate with Excavation (Considered for Alcas Facility Only)

<i>Excavation Capital Cost</i>	\$190,000
<i>ISCO Capital & Periodic Injection Cost:</i>	\$783,000
<i>Total Capital Cost:</i>	\$973,000

<i>Annual Operation & Maintenance (O&M) ISCO Costs:</i>	\$82,994
<i>Total Present Worth Cost:</i>	\$1,291,000
<i>Excavation Construction Time:</i>	3 - 6 months
<i>ISCO Construction Time</i>	1 – 2 years

This alternative is comprised of the remedial measures included in Alternative 3a, and adds excavation of what is estimated to be approximately 70 cubic yards of soils if, subsequent to treatment with ISCO, soils remain beneath or adjacent to the main building at the Alcas Facility at concentrations that are impacting the ability to achieve the groundwater RAOs using ISCO alone, and after a determination is made by EPA that it is not inappropriate to access the material based upon factors including the use of the building Excavation would remove remaining contaminated soil serving as a source material to the groundwater contamination of the upper aquifer.

Alternative 4: Enhanced *In-situ* Anaerobic Bioremediation (Considered for Parcel B Only)

<i>Capital and Periodic Injection Cost:</i>	\$642,000
<i>Annual Operation & Maintenance (O&M) Costs:</i>	\$101,000
<i>Present Worth:</i>	\$1,103,000
<i>Construction Time:</i>	1 – 2 years

EAB would involve the injection of amendments into the groundwater at the impacted depths using an injection well network. Once delivered, these chemicals promote reductive dechlorination, a process used to describe the degradation of VOCs, by microorganisms in the subsurface. Lactate, emulsified vegetable oil (EVO), and whey are examples of carbon sources used to augment and promote the biodegradation of chlorinated solvents by naturally occurring microorganisms called *dehalococcoides*. Under this alternative, bioaugmentation would likely be necessary to supplement the existing bacterial community at and around Parcel B. For the purposes of developing a conceptual design and cost estimate for comparison with other technologies, the FFS estimated the installation of 13 temporary injection points at Parcel B to depths between 10 and 40 feet bgs. Figure 2 provides the conceptual design for the injection well network. The FFS also estimated three injection events over a period of up to five years. The conceptual design and cost estimate are based on the results of a pilot study conducted at Parcel B using EAB.

Additional injections beyond the initial rounds outlined in the conceptual design may be required to achieve and maintain the remedial action. An estimated remediation time frame of 30 years was used for developing costs associated with O&M activities, including well maintenance and groundwater monitoring of attenuation processes.

Alternative 5: *In-situ* Chemical Oxidation (ISCO) Using Ozone (Considered for Parcel B Only)

<i>Capital & Periodic Injection Cost:</i>	\$823,000
<i>Annual Operation & Maintenance (O&M) Costs:</i>	\$81,444
<i>Present Worth:</i>	\$1,010,000
<i>Construction Time:</i>	1 – 2 years

This remedial alternative would involve the injection of ozone gas through a series of injection

wells to degrade organic contaminants in the groundwater. *In-situ* chemical oxidation results in the transformation through chemical reactions of the VOC contaminants into less harmful chemical compounds. For the purposes of developing a conceptual design and cost estimate for comparison with other technologies, the FFS estimated 170 injection wells would be installed to a depth of 20 feet bgs to treat the dissolved phase plume at Parcel B. The FFS also estimated five to 10 injection events over a period of up to five years. The actual cost of this alternative depends on numerous factors, including the number of injections and the percentage of contaminant mass remaining upon completion of each injection event.

Additional injections beyond the initial rounds outlined in the conceptual design may be required to achieve and maintain the remedial action. An estimated remediation time frame of 20 years was used for developing costs associated with O&M activities, including well maintenance and groundwater monitoring of attenuation processes.

11. COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy for a site, the EPA considers the factors set forth in CERCLA Section 121, 42 U.S.C. § 9621, by conducting a detailed analysis of the remedial alternatives FS pursuant to the requirements of the NCP at 40 C.F.R. § 300.430(e)(9), the EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies*, OSWER Directive 9355.3-01, and the EPA's *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, OSWER 9200.1-23.P. The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria set forth at 40 C.F.R. § 300.430(e)(9)(iii) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following “**threshold**” criteria are the most important and must be satisfied by any remedial alternative in order to be eligible for selection:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
2. **Compliance with ARARs** addresses whether a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver. Other federal or state advisories, criteria, or guidance are TBCs. While TBCs are not required to be adhered to by the NCP, the NCP recognizes that they may be very useful in determining what is protective of a site or how to carry out certain actions or requirements.

The following “**primary balancing**” criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies, with respect to these parameters, that a remedy may employ.
5. **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.
6. **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
7. **Cost** includes estimated capital, O&M, and present worth costs.

The following “**modifying**” criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and they may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. **State acceptance** indicates whether, based on its review of the RI/FS report, HHRA, and Proposed Plan, the State concurs with, opposes, or has no comments on the proposed remedy.
9. **Community acceptance** refers to the public's general response to the alternatives described in the RI/FS report, HHRA, and Proposed Plan.

A comparative analysis of the alternatives considered in this OU3 ROD and OU2 ROD Amendment, based upon the evaluation criteria noted above, follows.

11.1 Overall Protection of Human Health and the Environment

Alcas Facility

Since no action would be implemented, Alternative 1 would not meet RAOs, would not control exposure to contaminated soil, would not reduce risk to human health or the environment, and would not restore the groundwater. Alternative 2 would not be effective in reducing VOC contamination because of the heterogeneous soil conditions and the presence of DNAPL under the building and, therefore, would not be protective of human health and the environment. Alternatives 3a (ISCO using persulfate) and 3b (ISCO using persulfate with excavation) are expected to provide similar protection of human health and the environment at the Alcas Facility. Protectiveness under Alternatives 3a and 3b require a combination of actively reducing contaminant concentrations and limiting exposure to residual contaminants through institutional controls until RAOs are met.

Parcel B

Alternative 1 (No Action) would not meet RAOs and would not provide protection of human health and the environment, since contamination would remain in groundwater, and no mechanism would be implemented to prevent exposure to contaminated groundwater or restore groundwater. Alternative 4 (EAB) and Alternative 5 (ISCO using ozone) are both active remedies that would

restore groundwater quality within a reasonable timeframe. Protectiveness under Alternatives 4 and 5 requires a combination of actively reducing contaminant concentrations and limiting exposure to residual contaminants through institutional controls until RAOs are met.

11.2 Compliance with ARARs

EPA and NYSDOH have promulgated health-based protective MCLs (40 CFR Part 141, and 10 NYCRR § 5-1.51 Chapter 1), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). The aquifers are designated as a potable water supply. NYSDEC also has established groundwater standards at 6 NYCRR Part 703 which are applicable. The more stringent of the federal MCL and state Standard will be the groundwater cleanup standard for the Site. Because area groundwater is a source of drinking water, the MCLs are ARARs.

EPA has identified New York State's 6 NYCRR Part 375-6.3(b) for unrestricted use as an ARAR, a "to-be-considered", or other guidance to address contaminated soil at the Alcas Facility. A complete list of ARARs, TBCs and other guidelines is presented in Table 8 (chemical-specific), Table 9 (location-specific) and Table 10 (action-specific).

Alcas Facility

Alternative 1 would not comply with ARARs as no work would be conducted to address the contamination. Alternative 2 would not comply with chemical-specific ARARs since VER would not be effective in reducing VOC contamination in inaccessible areas beneath the main building. Alternative 3a is expected to reach chemical-specific ARARs within 20 years. Alternative 3b is expected to achieve chemical-specific ARARs at the same time as Alternative 3a unless there is soil excavation, in which case Alternative 3b would be expected to reach chemical-specific ARARs sooner. However, excavation would be conducted after implementation of ISCO with persulfate, after a determination is made by EPA that it is not inappropriate to access the material based upon factors including the use of the building.

RCRA is a federal law that mandates procedures for managing, treating, transporting, storing, and disposing of hazardous wastes. Relevant portions of RCRA would be met by Alternative 2, Alternative 3a and Alternative 3b. Alternative 3a and 3b would also comply with other location- and action-specific ARARs.

Parcel B

Alternative 1 would not comply with ARARs as no work would be conducted to address the contamination. Alternative 5 (ISCO with ozone) is expected to achieve chemical-specific ARARs within 20 years and Alternative 4 (EAB) is expected to achieve chemical-specific ARARs within 30 years. However, there is some additional uncertainty associated with the time frame under Alternative 5 since an *in-situ* pilot study using ISCO with ozone was not conducted.

Alternatives 4 and 5 would also comply with location- and action-specific ARARs.

11.3 Long-Term Effectiveness and Permanence

Alcas Facility

Alternative 1 does not provide long-term effectiveness or permanence because no active remedial measures are proposed. Alternative 2 (VER) would likely result in residual contamination mass remaining at the Alcas Facility resulting in continued releases of hazardous substances to the groundwater. Therefore, it would be the least effective and permanent of the active remedial alternatives considered.

ISCO has been demonstrated to be effective and reliable at numerous sites for treatment of VOCs in groundwater. Alternative 3a is expected to provide a high degree of long-term effectiveness and permanence since the pilot studies conducted at the Alcas Facility in 2011 and 2012 demonstrated that the oxidant can oxidize residual nonaqueous TCE, reducing contaminant mass in the shallow groundwater, which would reduce the flow into the City Aquifer. Alternative 3b could potentially provide the highest degree of long-term effectiveness and permanence since additional excavation activities could be performed in the future, if after a determination is made by EPA that it is not inappropriate to access the material based upon factors including the use of the building necessary.

Parcel B

Alternative 1 does not provide long-term effectiveness or permanence because no active remedial measures are proposed. EAB (Alternative 4) and ISCO with ozone (Alternative 5) have been demonstrated to be effective and reliable at numerous sites for treatment of VOCs in groundwater. The pilot study conducted at Parcel B in 2011 demonstrated that reductive dechlorination under Alternative 4 (EAB) could be achieved through the injection of an electron donor allowing for the degradation of chlorinated ethenes. Based on the results of the *in-situ* pilot study, bioaugmentation would likely be necessary in order to supplement the existing bacterial community to achieve complete reductive dechlorination of the contaminants. The bench scale treatability study performed to evaluate ISCO with ozone (Alternative 5) also demonstrated the ability to oxidize VOC contamination, though it would be difficult to manage the significant quantities of gas generated during the oxidation process.

11.4 Reduction of Toxicity, Mobility or Volume

Alcas Facility

Alternative 1 does not address contamination through treatment as no action would be taken. Additionally, Alternative 1 does not provide the means to assess a reduction in toxicity, mobility or volume (TMV) through treatment. Alternative 2 (VER) would likely only partially remove the contamination in the dense clay/till subsurface. Alternatives 3a and 3b would both provide a large reduction of contamination volume and toxicity, and thus mobility. The reduction of contaminant TMV under Alternatives 3a and 3b includes the DNAPL, which has been identified as principal threat waste. The pilot study conducted in 2012 demonstrated as much as a 50 percent reduction in TCE concentrations for each round of injection within the treatment area using ISCO with persulfate. Alternative 3b could potentially provide the greatest reduction in the volume of the soil contamination, if excavation is performed, as soils exceeding the remediation goals would be removed and disposed at an approved off-site facility.

Parcel B

Alternative 1 does not address contamination through treatment as no action would be taken. Additionally, Alternative 1 does not provide the means to assess a reduction in toxicity, mobility or volume (TMV) through treatment. Alternative 4 (EAB) would provide a greater reduction of contamination volume and toxicity, and thus mobility as compared to Alternative 5 (ISCO using ozone). The November 2011 pilot study demonstrated that reductive dechlorination occurred with a reduction in TCE concentration of approximately 95 percent and a reduction in total chloroethenes of approximately 85 percent. During the EAB under Alternative 4, TCE could be transformed into the more toxic vinyl chloride in the subsurface, prior to the degradation to the less toxic ethane. This transformation would need to be monitored and managed to prevent exposure via drinking contaminated water or inhalation through the vapor intrusion pathway.

11.5 Short-Term Effectiveness

Alcas Facility

Alternative 1 would have the fewest short-term impacts since no work would be performed and therefore, there would be no risks posed. Alternatives 2, 3a, and 3b may have potential short-term impacts to remediation workers, the public, and the environment during implementation. Remedy-related construction (e.g., well installation) under Alternatives 2, 3a, and 3b would involve disruptions to the manufacturing operations at the Alcas Facility. The well installation and injection activities can be sequenced in a manner that attempts to minimize disruption to manufacturing activities at the Alcas Facility. Additionally, injection lines to a majority of the wells inside the building can be trenched in place to allow for injection to occur without disruption to facility operations.

Drilling activities, including the installation of injection and monitoring wells, for Alternatives 2, 3a, and 3b could produce contaminated liquids that present some risk to remediation workers at the Site. The injection of oxidants under Alternatives 3a and 3b would also generate some waste that would be managed through the implementation of engineering controls, personnel protective equipment and safe work practices. The pilot study revealed a temporary increase in dissolved metals concentration following oxidant injection, but the effects were short-lived and the metals are likely to attenuate following depletion of the oxidant. However, a monitoring program would be implemented to monitor chemical by-products to ensure that the injections do not negatively impact drinking water. Removal of contaminated soil under Alternative 3b presents a higher short-term risk because of the greater potential for exposure associated with excavation and transportation of contaminated soil. However, measures would be implemented to mitigate potential impacts to workers and the community through the use of personnel protective equipment and standard health and safety practices. Under Alternative 3b, appropriate transportation safety measures would be required during the shipping of the contaminated soil to the off-site disposal facility.

Parcel B

Alternative 1 would be the most effective in the short term as there would be no work performed and therefore no risks posed. Alternatives 4 (EAB) and 5 (ISCO using ozone) may have potential short-term impacts to remediation workers, the public, and the environment during

implementation. Drilling activities, including the installation of monitoring and injection wells, could produce contaminated liquids that present some risk to remediation workers at the Site. However, measures would be implemented to mitigate exposure risks through the use of personnel protective equipment and standard health and safety practices. Alternative 5 is expected to have more short-term impacts compared to Alternative 4 because the quantity of ozone required to remove the dissolved phase contaminants under Alternative 5 could strip VOCs from the groundwater causing the gases to volatilize into the unsaturated soils. The off-gas generated during the stripping process would present a potential risk to the workers, via inhalation of the gas, and the environment, via the spread of contaminants from the groundwater to unsaturated soils. Data would be collected to monitor the off-gas generated and procedures would be implemented to mitigate potential impacts to workers. During the EAB under Alternative 4, TCE and cis-1,2 DCE could be transformed into the more toxic vinyl chloride under anaerobic conditions in the subsurface, prior to degradation to the less toxic ethane. This transformation would need to be monitored to ensure concentrations remain below levels that would present risk from exposure via drinking contaminated water or inhalation through the vapor intrusion pathway. No difficulties are foreseen with the required quantity of the injection material needed for Alternative 4 (EAB), as it is nonhazardous.

11.6 Implementability

Alcas Facility

Alternative 1 is no action and therefore there is nothing to implement. The presence of DNAPL beneath the main building at the Alcas Facility poses significant challenges because of the existing manufacturing operations at the facility. It is doubtful that Alternative 2 can be successfully implemented due to the presence of DNAPL under the building and the heterogeneous nature of the soil at the Alcas Facility. For the purposes of the ROD Amendment, Alternative 2 was maintained for comparison purposes. Alternatives 2, 3 and 3b are established technologies with commercially available equipment. Alternative 3a is a well-established technology and would be designed to address the DNAPL source under the building. The effectiveness of Alternative 3a would be controlled by the ability to distribute the oxidant in the subsurface under the main manufacturing building. However, through injection of sufficient oxidant volumes at appropriately spaced locations, distribution of the chemical oxidant can be achieved. Alternative 3b uses the same technology as Alternative 3a (ISCO using persulfate), however it also includes excavation if necessary. Excavation has implementation challenges due to the limited accessibility underneath the existing operating facility. Excavation activities determined to be necessary to achieve the groundwater RAOs under Alternative 3b would require a significant amount of coordination given the existing manufacturing operations at the Alcas Facility. Existing operations at the Alcas Facility would be negatively impacted by the excavation alternative as certain areas of the building critical to the manufacturing process might need to be partially demolished and this might involve substantial demolition costs. However if future operations change, or for instance if the portion of the building overlying the contamination is no longer in use or demolished, impacts resulting from excavation may not be significant; in fact, if the building is demolished excavation would be more readily implementable and be more important as unsaturated soils may be more amenable to leaching if the slab is compromised.

Alternatives 2, 3a, and 3b would require routine groundwater quality, performance, and administrative monitoring, including CERCLA five-year reviews. Alternatives 3a and 3b also may

require periodic injection of the solution and well maintenance for the life of each remedy. These activities are all easily implemented.

Parcel B

Alternative 1 is no action and therefore there is nothing to implement. Alternatives 4 and 5 are established technologies with commercially available equipment and are implementable. However, the injection of ozone gas under Alternative 5 (ISCO using ozone) may be somewhat more difficult than Alternative 4 (EAB) because of the highly heterogeneous soils that may prevent uniform distribution of the ozone gas. Ozone gas that does not come in contact with contamination is expected to react rapidly, thus hindering the ability of the ozone to travel laterally and creating a limited radius of influence. The pilot test determined that approximately five to 10 ozone applications would be required to completely oxidize high concentrations of dissolved phase TCE. The proximity of public drinking water supply well 18M to the treatment area also increases the design challenges with ISCO using ozone. However, these challenges can be addressed through the proper placement of injection wells and management of ozone gas quantities. No difficulties are foreseen with the required quantity of the injection material needed for Alternative 4 (EAB), as it is nonhazardous.

11.7 Cost

The estimated capital costs, operation, maintenance and monitoring (O&M) costs, and present worth costs for the Alternatives discussed in this Proposed Plan are presented below. Further detail may be found in the July 2014 FFS Report. The cost estimates are based on the best available information. The alternatives for the Alcas Facility assume that any upgradient sources impacting the Alcas Facility would be identified and effectively remediated or controlled. In that event, any change to the conceptual design at the Alcas Facility would be expected to result in a cost estimate that is within the “plus 50% to minus 30%” range of the actual project cost employed in Superfund cleanups. The present worth cost was calculated using a 7 percent discount rate. (I hope. Answer: yes)

Alternative	Capital Cost³	Annual O&M Cost	Present Worth Cost
Alcas Facility			
1 No Action	\$0	\$0	\$0
2 VER	\$338,000	\$100,000	\$1,400,000
3a ISCO	\$783,000	\$82,994	\$1,101,000
3b ISCO with excavation	\$973,000	\$82,994	\$1,291,000
Parcel B			
1 No Action	\$0	\$0	\$0
4 EAB	\$642,000	\$101,000	\$1,103,000
5 ISCO with ozone	\$823,000	\$81,444	\$1,010,000

11.8 State/Support Agency Acceptance

³ Capital Cost for Alternatives 3a, 3b and 4 include periodic injection costs.

NYSDEC concurs with the selected remedy for OU3 and the amended OU2 remedy.

11.9 Community Acceptance

The EPA solicited input from the community on the remedial alternatives proposed for the OU3 remedy and the amended OU2 remedy at the Alcas Source Area. Verbal comments received from community members at the August 5, 2014 public meeting generally related to the extent of contamination at the Alcas Source Area and the negative impact of the historical operations at the source areas to the drinking water supply for the City and Town of Olean. During the comment period from July 23, 2014 through August 22, 2014, one written comment was received. A copy of the written comment is provided as Attachment 5 to Appendix V. A summary of significant comments made, as well as EPA's responses to those comments, are provided in the Responsiveness Summary (Appendix V).

12. PRINCIPAL THREAT WASTES

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a Site whenever practicable (NCP Section 300.430(a) (1) (iii) (A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants, such as DNAPL in soil, that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment in the event exposure should occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described above. The manner in which principal threat wastes are addressed provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Varying concentrations of VOCs were detected in soil samples collected from borings installed within the main manufacturing building at the Alcas Facility. Results from the investigation showed concentrations of TCE as high as 280 parts per million (ppm), confirming the presence of DNAPL, in the soil/till zone at an approximate depth of nine feet below the foundation of the main building. This concentration represents the highest concentration of TCE detected in soil at the Alcas Facility.

These findings show the presence of "principal threat" wastes at the Alcas Facility. The selected amended OU2 remedy will actively treat this contamination through the use of ISCO using persulfate.

13. THE SELECTED REMEDY

13.1 Summary of the Rationale for the Selected Remedy

Based upon the requirements of CERCLA, the results of Site investigations, the detailed analysis of the alternatives, and public comments, the EPA has determined that Alternative 3b for the Alcas Facility, in conjunction with Alternative 4 for Parcel B, best satisfy the requirements of CERCLA Section 121, 42 U.S.C. §9621, and provides the best balance of tradeoffs among the

remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9).

Additional investigations conducted subsequent to the OU2 ROD revealed conditions at the Alcas Facility that were not known at the time of the issuance of the OU2 ROD. The additional investigations revealed a DNAPL mass underneath the Alcas Facility main building and geological conditions in the till unit, which could not feasibly nor effectively be remediated using VER, the remedy selected in the OU2 ROD, making VER (Alternative 2) impractical. Alternative 1 was not selected, because it is simply a baseline for comparison with other alternatives and is not protective of human health and the environment. Groundwater would continue to be impacted by DNAPL-impacted soil for an indefinite period of time. The impacted groundwater would continue to contain COCs at concentrations that exceed federal MCLs and/or the NYSDEC Class GA standards. Pilot studies conducted at the Alcas Facility have demonstrated the effectiveness of treating the contaminated soil and groundwater at the Alcas Facility, including the DNAPL mass underneath the main building, by injecting ISCO with activated persulfate. Although both Alternatives 3a and 3b involve the use of ISCO with activated persulfate to treat the contaminated soil and groundwater at the Alcas Facility, Alternative 3b provides for the excavation of remaining contaminated soil beneath and adjacent to the main building that are determined to be impacting groundwater RAOs, subsequent to treatment with ISCO, if EPA determines that it is not inappropriate to access the material based upon factors including the use of the building, thereby providing a higher degree of long-term effectiveness and permanence.

In addition, these additional investigations revealed groundwater contamination in the upper aquifer on Parcel B, which was also not known in when the OU2 ROD was issued. While pilot studies conducted on Parcel B have demonstrated the effectiveness of treating contaminated groundwater in the upper aquifer using EAB (Alternative 4) and ISCO using ozone (Alternative 5), Alternative 4 is preferable to Alternative 5 because EAB has fewer short-term impacts during implementation.

13.2 Description of the Selected Remedy

The major components of the selected amended remedy for OU2 for the Alcas Facility include the following:

- *In-situ* chemical oxidation (ISCO) involving injection of an alkaline-activated sodium persulfate solution through a series of injection wells located beneath the main building and along the exterior of the southern portion of the main building to treat soil and groundwater contamination;
- Excavation of remaining contaminated soil beneath and adjacent to the main building that are determined to be impacting the ability to achieve the groundwater RAOs, subsequent to treatment with ISCO and after a determination is made by EPA that it is not inappropriate to access the material based upon factors including the use of the building;
- Additional sampling during the pre-remedial design phase to determine whether an upgradient source of groundwater contamination is present in the northern portion of the Alcas Facility or off-property;

- Institutional controls for soil and groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. A plan will be developed which specifies institutional controls to restrict exposure to hazardous substances until RAOs are met which are anticipated to include proprietary controls, such as deed restrictions for groundwater and soil use, existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies regarding groundwater use in the impacted area;
- Implementation of a long-term groundwater monitoring program to track and monitor changes in the groundwater contaminant levels to ensure the RAOs are attained. The sampling program will also monitor groundwater quality including degradation by-products generated by the treatment processes to ensure that drinking water quality standards are met at the nearby municipal water supply well 18M and to address the potential for migration of vapors from groundwater to indoor air at the Alcas Facility that could result from the ISCO treatment. The results from the long-term monitoring program will be used to evaluate the migration and changes in VOC contaminants over time; and
- Development of a site management plan (SMP) to provide for the proper management of the Site remedy post-construction, including through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews and certifications. The SMP will also provide for the proper management of any contaminated unsaturated soils remaining beneath the concrete slab of the building and the evaluation of the potential for soil vapor intrusion should the building use at the Alcas Facility change or for any buildings developed on the Alcas Facility.

The major components of the selected OU3 remedy for Parcel B include the following:

- Enhanced anaerobic bioremediation (EAB) to promote reductive dechlorination of contamination through a series of injection wells to degrade organic contaminants;
- Institutional controls for groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. A plan will be developed which specifies institutional controls to restrict exposure to hazardous substances until RAOs are met which are anticipated to include proprietary controls, such as deed restrictions for groundwater use, existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies regarding groundwater use in the impacted area;
- Implementation of a long-term groundwater monitoring program to track and monitor changes in the groundwater contamination to ensure the RAOs are attained. The sampling program will also monitor groundwater quality including degradation by-products generated by the treatment processes to ensure that drinking water quality standards are met at the nearby municipal water supply well 18M. The results from the long-term monitoring program will be used to evaluate the migration and changes in VOC contaminants over time; and

- Development of a site management plan (SMP) to provide for the proper management of the Site remedy post-construction, including through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews and certifications. The SMP will also provide for the evaluation of the potential for soil vapor intrusion for any buildings developed on Parcel B.

The environmental benefits of the selected remedy for the Alcas Source Area may be enhanced by employing design technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy⁴.

13.2 Summary of Estimated Remedy Costs

The estimated capital, annual O&M, and total present worth costs for the selected remedy for OU3 and amended OU2 remedy are discussed in detail in the 2014 FFS Report. The costs estimates are based on available information and are order-of-magnitude engineering cost estimates that are expected between +50 to -30 percent of the actual project cost. Changes to the cost estimate can occur as a result of new information and data collected during the design of the remedies.

A cost estimate summary for the selected remedies is presented in Table 11. The estimated capital, annual O&M, and total present worth costs for the Alcas Facility and Parcel B are presented below:

Alternative	Capital Cost ⁵	Annual O&M Cost	Present Worth Cost
Alcas Facility	\$973,000	\$82,994	\$1,291,000
Parcel B	\$642,000	\$101,000	\$1,103,000
Total	\$1,615,000	\$183,994	\$2,394,000

13.3 Expected Outcomes of the Selected Remedy

The selected OU3 remedy and amended OU2 remedy address areas of VOC contamination in the Parcel B groundwater and Alcas Facility soil and groundwater, respectively. The results of the human health risk assessments indicate that the contaminated groundwater at OU2 and OU3 present an unacceptable exposure risk.

The contaminated soil below the building at the Alcas Facility, does not necessarily present a direct-contact risk due to the depth of the soil and the fact that it is under the building. However, the contaminated soils serve as source material (and is principal threat waste) for continued groundwater contamination and, therefore, it is necessary to address the soil contamination in relation to the groundwater remedy.

Under the selected OU2 amended remedy, *in-situ* chemical oxidation with persulfate will be used to remediate contaminated soil and groundwater at the Alcas Facility. Subsequent to the

⁴ See http://epa.gov/region2/superfund/green_remediation.

⁵ The capital cost for the selected remedies include periodic injection costs.

treatment of contaminated soil by ISCO, if the soil continues to be impacting the ability to achieve groundwater RAOs, factors including the use of the building will be considered by EPA to determine whether it is appropriate to excavate any remaining contaminated soil. An estimated 70 cubic yards of soil beneath or adjacent to the main building at the Alcas Facility RAOs would be excavated. In addition, performance and long-term monitoring data will be evaluated to update the estimated time frame to achieve groundwater RAOs. Based on this evaluation, and if EPA determines that it is appropriate to excavate the material, the benefits of excavation/removal of source material to reduce TMV, versus remediation through ISCO only will be taken into consideration by EPA.

The selected OU3 remedy will use EAB to promote reductive dechlorination of contamination and remediate contaminated groundwater at Parcel B. The selected OU2 amended remedy for the Alcas Facility and the selected OU3 remedy for Parcel B will restore the aquifer at the Alcas Source Area, which is designated by New York State for use as a source of drinking water, in a reasonable timeframe by reducing contaminant levels to federal MCLs and State standards.

Cleanup levels for the Contaminants of Concern at the Alcas Source Area are presented in Appendix II, Table 7.

14. STATUTORY DETERMINATIONS

The EPA has determined that the selected OU3 and the amended OU2 remedies comply with the CERCLA and NCP provisions for remedy selection, meet the threshold criteria, and provide the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. These provisions require the selection of remedies that are protective of human health and the environment, comply with ARARs (or justify a waiver from such requirements), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the TMV of hazardous substances as a principal element (or justifies not satisfying the preference). The following sections discuss how the selected OU3 and amended OU2 remedies meet these statutory requirements.

14.1 Protection of Human Health and the Environment

The selected OU3 and amended OU2 remedies will protect human health and the environment because they will, over the long-term, restore groundwater quality at the Alcas Source Area to drinking-water standards. Protection will be achieved by addressing direct-contact and ingestion risks to human health associated with future consumption of contaminated groundwater, and will address the residual DNAPL-impacted subsurface soil that contains contamination which can then migrate to groundwater if untreated, thereby eliminating or reducing sources of contamination to the groundwater. The institutional controls required by both remedies will also assist in protecting human health over both the short- and long-term by helping to control and limit exposure to hazardous substances until the remedial action goals are met.

14.2 Compliance with ARARs

The selected OU3 and amended OU2 remedies comply with chemical-specific, location-specific and action-specific ARARs. A complete list of the ARARs, TBCs and other guidance that concern the selected remedies is presented in Table 8 (chemical-specific), Table 9 (location-specific) and Table 10 (action-specific), which can be found in Appendix II.

14.3 Cost Effectiveness

A cost-effective remedy is one in which costs are proportional to the remedy's overall effectiveness (NCP Section 300.430(f)(1)(ii)(D)). The EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (*i.e.*, those that were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness.

Each of the alternatives has undergone a detailed cost analysis. In that analysis, capital and annual O&M costs were estimated and used to develop present worth costs. In the present worth cost analysis, annual O&M costs were calculated for the estimated life of each alternative. The estimated present worth cost for implementing the selected amended OU2 remedy for the Alcas Facility is \$1,291,000, whereas the estimated present worth of Alternative 2 and 3a are \$1,400,000 and \$1,101,000, respectively. Based on the comparison of overall effectiveness to cost, the selected amended OU2 remedy, Alternative 3b, meets the requirement that Superfund remedies be cost effective (NCP Section 300.430(f)(1)(ii)(D)) in that it is only slightly more costly than the lowest cost active alternative, Alternative 3a, while potentially providing a higher degree of long-term effectiveness and permanence, and achieving groundwater RAOs more quickly than Alternative 3a, if excavation activities are performed. A 20-year timeframe was used for planning and estimating purposes to remediate groundwater at the Alcas Facility, although remediation timeframes could exceed this estimate.

The estimated present worth cost for implementing the selected remedy for Parcel B is \$1,103,000, whereas the estimated present worth of Alternative 5 is \$1,010,000. Based on the comparison of overall effectiveness to cost, the selected remedy, Alternative 4, meets the requirement that Superfund remedies be cost effective (NCP Section 300.430(f)(1)(ii)(D)) in that it is only slightly more costly than the lowest cost active alternative, Alternative 5, while providing the least short-term impacts during implementation. A 30-year timeframe was used for planning and estimating purposes to remediate groundwater at Parcel B, although remediation timeframes could exceed this estimate.

14.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to Maximum Extent Practicable

The selected OU3 and amended OU2 remedies provide the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in the NCP Section 300.430(f)(1)(i)(B), because they each represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Alcas Source Area. The selected OU3 and amended OU2 remedies satisfy the criteria for long-term effectiveness and permanence by removing contaminant mass with elevated levels of VOC concentrations. The combination of *in-situ* chemical oxidation and soil excavation at the Alcas Facility and EAB at Parcel B will

permanently reduce the mass of contaminants in soil and groundwater at the Alcas Source Area, thereby reducing the toxicity, mobility, and volume of contamination.

The selected OU3 remedy and amended OU2 remedies are implementable because they employ standard technologies that are readily available. Additionally, the selected amended OU2 remedy provides for the excavation of soils remaining beneath or adjacent to the main building at the Alcas Facility at concentrations that are impacting the ability to achieve the groundwater RAOs using ISCO alone, if and when a determination is made that it is not inappropriate to access the material based upon factors including the use of the building. Excavation would remove remaining contaminated soil serving as a source material to the groundwater.

14.5 Preference for Treatment as a Principal Element

Through the use of *in-situ* (ISCO and EAB) treatment technologies, the selected amended OU2 remedy and selected OU3 remedy, respectively, satisfy the statutory preference for remedies that employ treatment as a principal element.

14.6 Five-Year Review Requirements

Both remedies will result in hazardous substances, pollutants, or contaminants remaining at the Alcas Source Area until performance standards are attained, and as such, use and exposure must be limited until such standards are met. Since it may take more than five years to attain the cleanup levels, policy reviews pursuant to Section 121(c) of CERCLA will be conducted no less often than once every five years after the completion of construction to ensure that the remedies are, or will be, protective of human health and environment.

15. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Alcas Source Area was released on July 23, 2014. The Proposed Plan identified Alternative 3b as the preferred alternative for remediating the contaminated soil and groundwater at the Alcas Facility (OU2) and Alternative 4 as the preferred remedy for remediating contaminated groundwater at Parcel B (OU3).

The EPA reviewed all written (including electronic formats such as e-mail) and oral comments during the public comment period and has determined that no significant changes to the remedy, as originally identified in the Proposed Plan, are necessary or appropriate.

APPENDIX I

FIGURES

APPENDIX II

TABLES

APPENDIX III
ADMINISTRATIVE RECORD INDEX

APPENDIX IV

NEW YORK STATE CONCURRENCE LETTER

